

COURSE OUTLINE

(1) GENERAL

SCHOOL	School of Engineering		
ACADEMIC UNIT	Informatics and Computer Engineering		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE		SEMESTER	6 th
COURSE TITLE	Distributed Systems		
INDEPENDENT TEACHING ACTIVITIES if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits	WEEKLY TEACHING HOURS	CREDITS	
	4	5	
Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).			
COURSE TYPE general background, special background, specialised general knowledge, skills development	Specialised general knowledge, skills development		
PREREQUISITE COURSES:	Computer Programming		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes (in English)		
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/courses/CS157/		

(2) LEARNING OUTCOMES

<p>Learning outcomes</p> <p>The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course are described. Consult Appendix A</p> <ul style="list-style-type: none"> • Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area • Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B • Guidelines for writing Learning Outcomes 		
<p>The course aims to introduce the basic concepts of distributed processing, the principles and elements of distributed systems so that students understand the technologies that govern them and how to effectively utilize the services they offer.</p> <p>Upon successful completion of the course, the student:</p> <ul style="list-style-type: none"> • will be able to describe the basic functions of a distributed system • will have understood the basic concepts and techniques/mechanisms of synchronization and communication used in modern distributed systems • will have become acquainted with the techniques of allocation of resources, data and tasks in computing systems that work together over a network, and the necessary mechanisms of synchronization and control of the communication • will have an appropriate theoretical and practical background so that he/she can meet the requirements of modern trends in the design, development and support of distributed systems and applications. 		
<p>General Competences</p> <p>Taking into consideration the general competences that the degree-holder must acquire (as these appear in the Diploma Supplement and appear below), at which of the following does the course aim?</p> <table style="width: 100%; border: none;"> <tr> <td style="width: 50%;">Search for, analysis and synthesis of data and information, with the use of the</td> <td style="width: 50%;">Project planning and management Respect for difference and multiculturalism</td> </tr> </table>	Search for, analysis and synthesis of data and information, with the use of the	Project planning and management Respect for difference and multiculturalism
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necessary technology	Respect for the natural environment
Adapting to new situations	Showing social, professional and ethical responsibility and sensitivity to gender issues
Decision-making	Criticism and self-criticism
Working independently	Production of free, creative and inductive thinking
Team work
Working in an international environment	Others...
Working in an interdisciplinary environment
Production of new research ideas	

- Search for, analysis and synthesis of data and information, using the necessary technologies
- Autonomous work
- Team work
- Adaptation to new situations
- Work in an interdisciplinary environment
- Generating new research ideas
- Promotion of free, creative and inductive thinking

(3) SYLLABUS

<p>Theory:</p> <ul style="list-style-type: none"> • Basic Concepts of Distributed Systems, Distributed Processing, Middleware, Middleware Services • Organization of Distributed Systems, Client-Server Model (client-server), Peer-to-Peer Systems (P2P systems) • Distributed Systems Communication, Remote Procedure Call, Remote Objects, Remote Method Call, Message-Oriented Communication, Stream-Oriented Communication • Event Scheduling, Synchronization, Logical Clocks, Leader Election Algorithms, Mutual Exclusion Algorithms, Distributed Transactions • Fault Tolerance, Failure Models, Failure Masking through Redundancy • Agreement in Faulty Distributed Systems, Distributed Commitment, Fault Recovery • Distributed File Systems, Name and Directory Services • Computing in a cluster environment (cluster computing). System software, network communication requirements, task scheduling, programming techniques and tools, etc. • Introduction to Cloud Computing (definitions, models, services, the MapReduce model). <p>Lab:</p> <p>The client-server communication model (internet domain sockets). Middleware - Unix RPC / JRPC / Java RMI / CORBA / XML RPC. HTCondor and Hadoop/MapReduce.</p>
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(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Face-to-face. Use of distance learning (if required)	
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	Use of ICT in Course Teaching and Laboratory Education, Use of ICT in Communication with Students Post course material on the University's e-learning platform (e-class). Use of email and e-class in communication with students.	
TEACHING METHODS	Activity	Semester workload
The manner and methods of teaching are described in detail. Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, placements, clinical practice, art workshop, interactive teaching, educational visits, project, essay writing, artistic creativity, etc.	Lectures	26
	Problem Solving in Class	13
	Laboratory Education	13
	Lab exercises	20
	Non-guided study	53
	Course total	125

<p>The student's study hours for each learning activity are given as well as the hours of non-directed study according to the principles of the ECTS</p>	
<p style="text-align: center;">STUDENT PERFORMANCE EVALUATION</p> <p>Description of the evaluation procedure</p> <p>Language of evaluation, methods of evaluation, summative or conclusive, multiple choice questionnaires, short-answer questions, open-ended questions, problem solving, written work, essay/report, oral examination, public presentation, laboratory work, clinical examination of patient, art interpretation, other</p> <p>Specifically-defined evaluation criteria are given, and if and where they are accessible to students.</p>	<p>Final Grade = (70% * Grade of the Theory_Part) + (30% * Grade of the Laboratory Part)</p> <p><i>Evaluation Process of Theory Part:</i> Final written exam at the end of the semester</p> <p><i>Evaluation Process of Laboratory Part:</i> Preparation of laboratory exercises / assignments and oral or written examination</p> <p>The evaluation process is disclosed to the students in class and online, via e-class.</p>

(5) ATTACHED BIBLIOGRAPHY

1. Van Steen M., and Tanenbaum A.S., Distributed Systems, 3rd ed., distributed-systems.net, 2017
2. Κάβουρας Ι.Κ., Μήλης Ι.Ζ., Ευλωμένος Γ.Β., Ρουκουνάκη Α.Α., Κατανεμημένα Συστήματα με Java, 3η έκδοση, Εκδόσεις Κλειδάριθμος, 2011.
3. Coulouris G., Dollimore J., Kindberg T., Blair G., Distributed Systems, Concepts and Design, 5th ed., Addison-Wesley, 2011.
4. Kai Hwang, Jack Dongarra, and Geoffrey Fox, Distributed and Cloud Computing, Morgan Kaufmann, 2011.
5. Lynch N.A., Distributed Algorithms, Morgan Kaufmann, 1997.
6. Tel G., Introduction to Distributed Algorithms, 2nd ed., Cambridge University Press, 2001.
7. Attiya H., Welch J., Distributed Computing Fundamentals, Simulations, and Advanced Topics, 2nd ed., McGraw-Hill, 2004.
8. Brose G., Java Programming with CORBA: Advanced Techniques for Building Distributed Applications, Wiley, 2001.
9. Tom White, Hadoop: The Definitive Guide, 4th Edition, O'Reilly Media, 2015.
10. William Grosso, Java RMI: Designing & Building Distributed Applications, 1st edition, O'Reilly Media, 2011.